

Initial incidence of white matter hyperintensities on MRI in astronauts

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Introduction: Previous literature has described the increase in white matter hyperintensity (WMH) burden associated with hypobaric exposure in the U-2 and altitude chamber operating personnel. Although astronauts have similar hypobaric exposure pressures to the U2 pilot population, astronauts have far fewer exposures and each exposure would be associated with a much lower level of decompression stress due to rigorous countermeasures to prevent decompression sickness. Therefore, we postulated that the WMH burden in the astronaut population would be less than in U2 pilots.

Methods: Twenty-one post-flight de-identified astronaut MRIs (5 mm slice thickness FLAIR sequences) were evaluated for WMH count and volume. The only additional data provided was an age range of the astronauts (43-57) and if they had ever performed an EVA (13 yes, 8 no).

Results: WMH count in these 21 astronaut MRI was 21.0 ± 24.8 (mean \pm SD) and volume was 0.382 ± 0.602 ml, which was significantly higher than previously published results for the U2 pilots. No significant differences between EVA and no EVA groups existed. Age range of astronaut population is not directly comparable to the U2 population.

Discussion: With significantly less frequent (sometimes none) and less stressful hypobaric exposures, yet a much higher incidence of increased WMH, this indicates the possibility of additional mechanisms beyond hypobaric exposure. This increase unlikely to be attributable just to the differences in age between astronauts and U2 pilots. Forward work includes continuing review of post-flight MRI and evaluation of pre to post flight MRI changes if available. Data mining for potential WMH risk factors includes collection of age, sex, spaceflight experience, EVA hours, other hypobaric exposures, hyperoxic exposures, radiation, high performance aircraft experience and past medical history. Finally, neurocognitive and vision/eye results will be evaluated for any evidence of impairment linked to increased WMH.